THE EXTERNAL MORPHOLOGY OF THE MEXICAN BEAN BEETLE, EPILACHNA CORRUPTA MULS. (COCCINELLIDÆ, COLEOPTERA)[1]

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The Coccinellidæ are very important from an economic standpoint, largely because of their predaceous habit. One tribe, the Epilachnini, feeds upon plants and two species, *Epilachna corrupta* Muls. and *E. borealis* (Fab.), are pests in the United States. From a taxonomic viewpoint the Coccinellidæ are very difficult to classify because of their size and uniformity of appearance. Perhaps a detailed study of the external morphology of one species, *E. corrupta* Muls., will suggest the use of some structures of taxonomic value, that are not made use of at present.

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GENERAL DESCRIPTION

The bean beetle is about one-fourth of an inch long and one-fifth of an inch wide. The general body color varies from a light yellow to brown, depending on age and somewhat on environmental conditions. The elytron is usually marked with eight black spots as follows: three near the base, three near the center forming a transverse row, and two near the apex. The entire external surface of the body is clothed with minute setæ giving the beetles a pubescent appearance. In the following study no mention is made of setæ unless they are of a different appearance from the pubescence mentioned above.

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LITERATURE

Studies in the morphology of certain families of the Coleoptera include the following: Hayes (1922) and Friend (1929) on the Scarabaeidæ, Korschelt (1923) on the Dystiscidæ, Van Zwaluwenburg (1922) on the Elateridæ, and Rivnay (1928) on the Chrysomelidæ. Those who have worked on special structures of the Order include Forbes (1922, 6) and Graham (1922) on the wings; Stickney (1923) on the head capsule; Tanner (1927), Wilson (1926, 7), Sharp and Muir (1912), and Muir (1918) on the genitalia. Works on the general morphology that have proved of value in this study include the text by MacGillivray (1923), and the numerous papers of Snodgrass and Crampton, especially the latter.

THE HEAD

Head Capsule. The head capsule of the Mexican bean beetle is somewhat elliptical in shape, being broader than long. It is composed of several united sclerites, those found on the more primitive Coleoptera having fused so that all of the sutures have nearly or entirely disappeared. The epicranial suture has disappeared on the dorsal surface (Fig. 2). It is doubtful if any portion of the arms of this suture remain. Stickney (1923) found a trace of the epicranial arms ventro-cephalad of the compound eyes (e) in two species of Coccinellidæ, *Hippodamia convergens* Guer. and *Adalia bipunctata* (L). The dorsal surface of the epicranium cannot be divided accurately into the recognized areas because of the absence of ridges and sutures. The position of the frontal pits (fp) cephalad of the compound eyes is indicated in the figure although the depressions are rather obscure. The labrum (lr) is attached to the head capsule by a membrane which may be the anteclypeus. The antennifer (anf) is prominent and serves as a pivot for the scape (ac) of the antenna. The ventral aspect of the head is shown in Figure 1. The raised area between the gular sutures (gs) is the gula (gl). The sutures extend only a short distance cephalad from the magnum foramen (mt), where they lead into the distinct gular pits (gp). Extending cephalad from the magnum foramen and laterad of the gular sutures are prominent folds which are associated with a change in level of the gula from the surrounding areas. The anterior portion of the gular region is not demarked laterally. The hypostoma (h) to which the mandibles (md) and maxilla (mx) are attached is sharply defined.

The tentorium has two parts each extending from the frontal (fp) to the gular (gp) pits. One of these is shown in Figure 3. The pits are the external manifestations of the invaginations of the head capsule to form the internal processes of the tentorium. The body of the tentorium has apparently disappeared leaving only the anterior (at) and posterior (pt) arms. A remnant of the dorsal arm (dt) is indicated by a small protuberance at the point of junction of the anterior and posterior arms. The anterior arm shows a slight thickening near the frontal pit, but the posterior arm is greatly enlarged in the gular region (gl). The cephalic extension of the posterior arm is a very delicately sclerotized rod that is difficult to dissect out without breaking. Apparently the fusing of sclerites and loss of sutures of the head capsule has been accompanied by a reduction in size and rigidity of the tentorium until it is nothing more than two delicate rods.

The eyes (e) are very prominent organs about twice as long as broad. They are located on the cephalo-lateral margins of the head and can be seen from both the dorsal and ventral aspects of it. The ocular sclerites are found on the inside periphery of the eyes. There are no ocelli.

The antennæ (Fig. 2), composed of eleven segments each, are meso-cephalad of the eyes. The bulb (b, Fig. 5) of the scape (ac) fits into the antennal socket (as). It is slightly enlarged but does not form a distinct ball like that in the more primitive Coleoptera such as the Meloidæ. The scape is the longest segment of the antenna. The pedicel (pd) is narrower and shorter than the scape, but is broader than the first six segments of the flagellum (fu). The first segment of the latter is slightly longer than the pedicel while the remaining eight segments are shorter. Segments two to six are short and stout. The three terminal segments are greatly broadened, largely on one side, forming a rather distinct club.

Mouthparts. The labrum (Fig. 9) is composed of two parts which may be called antelabrum (lr) and postlabrum (pl) for convenience, although the region designated postlabrum may be the anteclypeus or a fusion of the two structures. Stickney (1923) states that the preclypeus (anteclypeus) is always present and is usually membranous. The labrum is attached to the head capsule by a membrane between the dorsal surface of the postlabrum and the clypeal region. This membrane is termed the preclypeus by Stickney. The antelabrum, the only part of the labrum showing externally, is covered with numerous prominent setæ that project beyond the anterior margin.

The epipharynx (ep, Fig. 4), lining the under side of the labrum, forms the roof of the mouth and extends caudad under the clypeal region. It is membranous in structure and has minute ridges arranged over a bell shaped area indicated by the dotted lines in Figure 4. These ridges are densely setose, while the remaining portion is smooth or sparsely covered with hairs.

The hypopharynx (hp, Fig. 4), a flat, rounded lobe much smaller than the epipharynx, is attached mainly to the dorsal side of the labium. The cephalic margin is covered with a very dense mass of slender hairs. The dorsal surface is thickly clothed with minute setæ, while the ventral region is more sparsely covered with similar setæ. Several slender bristles are also found on the ventral surface. The pharyngeal cavity opens between the hypopharynx and epipharynx.

The mandibles (md) have their mesal margins covered by the labrum (lr, Fig. 2). The incisor region is well developed and bears three sharp teeth (Fig. 12). These regions of the two mandibles overlap, increasing the efficiency when cutting plant tissues. They articulate with the head capsule at two points, a dorso-lateral one where a protuberance of the latero-clypeal region fits into the ginglymus of the mandible and a ventro-lateral one where the condyle (c) of the mandible fits into the acetabulum of the postgenal region. The basal sclerite (bc) has apparently fused so firmly with the mandible that only a small projection not demarked by a suture remains. A ventro-mesal membranous lobe, the submola (sa), on the basal portion of the mandible bears a dense fringe of setæ on its mesal margin. Scattered setæ are present on the basal half of the mandible.

The maxilla is shown in Figure 11. The cardo (cd) contains a deep groove on its basal edge by which it articulates with the hypostoma (h, Fig. 1). An internal projection, the cardo process (cp), extends into the head capsule and serves for muscle attachment. The next division of the maxilla, the stipes (st), is composed of two triangular sclerites (Crampton, 1923). The palpifer (pfr) situated dorsad of the basal sclerite of the stipes is a hollow cylinder bearing the four segmented palpus (mp). The fourth segment of the palpus is the longest, followed by the second, third, and first in the order given. Each segment, beginning with the basal end, is wider than the preceding one. The fourth segment is flattened and membranous on the distal end and probably contains sensory organs on this area. The galea is composed of two segments, the basigalea (bb) and the distigalea (da). The former is sclerotized on its dorsal surface and membranous on its ventral surface. It is attached to the distal end of the stipes. The lacinia (la), a pear-shaped sclerite from the ventral aspect, is attached to the stipes also. The distal ends of the lacinia and the distigalea are covered with dense brushes of hairs that often are worn short in old specimens. The maxilla is covered with many minute setæ but is devoid of spines or teeth.

The true labium is attached to the head capsule between the maxillæ by the mentum and submentum, sclerites which are generally included as a part of the labium, but strictly speaking are not a part of it (Crampton, 1928). The subdivisions of the labium (Fig. 10) are submentum, mentum, united palpigers, united paraglossæ, and palpi. The submentum (sm) is a heavily sclerotized sclerite firmly attached to the gular region of the head capsule. The mentum (mn) is movably attached to the submentum. The distal third, to which are attached the united palpigers, is membranous while the basal portion is heavily sclerotized. The palpigers (np) have become united (Crampton, 1928) forming a thick, fleshy structure rather heavily sclerotized which bears the palpi. The palpi (lp) are composed of three segments, the first very short, the second longest, with the third slightly shorter than the second and tapering to a point at the distal end. The paraglossæ (ds) have become fused also and form the distal lobe of the fleshy stalk made up of the united palpigers. A longitudinal groove marks the line of union of the two palpigers and the two paraglossæ. The entire structure is densely covered with very minute setæ. The glossæ have become fused with the paraglossæ or have been lost.

THORAX

Cervical sclerites. The lateral cervicalia (lc, Fig. 6) appear as dumb-bell shaped sclerites in the intersegmental membrane between the prothorax and head capsule. The cephalic end is more enlarged than the caudal end. There is a faint trace of a suture through the median portion of the cervicalia.

Prothorax. The pronotum (pn, Figs. 6, 7, 8) comprises a single sclerite which is about three times as long as broad from the dorsal aspect. The latero-cephalic margins are extended forward along the sides of the head. The pronotum extends ventrad to the precoxal bridge (pc) cephalad of the coxæ (cx) and to the furcasternum (fs) caudad of the coxæ. A lateral carina is formed at the line of folding between the dorsal and ventral surface. This does not take the place of a suture as has been shown by Crampton (1926). The ventral portion of the pronotum probably overlaps the pleuron and fuses with it.

The basisternum (bs, Figs. 6, 7) is broad anteriorly and very much reduced between the coxæ (cx). The anterolateral branches of the basisternum are the precoxalia (pc) which unite with the pronotum. A suture separates the precoxalia from the pronotum. The furcasternum (fs) is between and behind the coxæ. The lateral extensions uniting with the pronotum form the postcoxal bridges (pcx) closing the coxal cavities posteriorly. The furcal pits (fp) are very shallow slits produced by invaginations forming the furcæ (f). The furcæ are internal projections of the body wall extending dorsad and serving for muscle attachment. The trochantin (tn, Fig. 24) is a small pleural sclerite that has been drawn internally with the basal portion of the coxæ (cx). It is movably attached to the coxæ and to the body wall by a membrane.

The leg is shown in figure 27. The coxa (cx, Figs. 6, 7, 24, 27) extends into the body cavity, the basal third not being visible externally. It is about three times as long as broad in its widest part and rotates antero-posteriorly in the coxal cavity. The dorsal surface is open for about two-thirds of its length for the entrance of muscles and other internal structures. On one side near the apex of the coxa is a cavity which receives the condyle of the trochanter (tr). The latter is a somewhat triangular shaped segment articulating distally with the femur (fr) and basally with the coxa. The movement between the trochanter and femur is very much restricted. The flexor surface is indented to receive the distal end of the tibia when the leg is folded. The femur is the largest segment of the leg and is about three times as long as broad. It tapers somewhat at the ends and is deeply and broadly grooved on its flexor surface to receive the tibia. The distal end contains a cavity for the reception of the condyle of the tibia. The tibia (ti) is about as long as the femur and about two-thirds as wide. It is elbowed at the basal end which permits it to fit into the groove of the femur when the leg is folded. There are two spurs (sb) on the flexor surface at the distal end. The articulation with the femur permits more freedom of movement of the tibia than is found with the other divisions of the leg. The dorsal surface is deeply hollowed for reception of the tarsus when the leg is folded. The tarsus (ta) is distinctly four segmented as with many of the Coccinellidæ. The so-called apparently three-segmented tarsus is a character used in many keys to separate this from the other Coleopterous families. Since beginning students can easily see the four segments in many species it is very misleading to speak of the Coccinellidæ as having apparently three segmented tarsi. The first segment is conical, being narrow at the point of articulation with the tibia and is broadened and cut off obliquely at the distal end. It is densely pubescent beneath. The second segment is flat and triangular in shape, being broadened distally. The distal third is densely pubescent beneath. An opening is present on the dorsal surface just before the middle for reception of the third segment. The latter is very short and cylindrical in shape. It articulates with the second but is immovably attached to the fourth segment. The fourth segment is conical and curved, the distal portion being the largest. This is the longest segment of the tarsus. Distally it bears two bifid claws, which are longer than the third segment.

Mesothorax. The mesothorax is the smallest of the three thoracic segments. The notum (Figs. 13, 14) can be divided into three areas: the prescutum (psc), scutum (sc), and scutellum (sl). The cephalic margin of the prescutum is V-shaped, the extensions of the arms forming the suralares (su). The scutum is the area between the prescutum and scutellum. Both the scutum and prescutum lie beneath the caudal margin of the pronotum. The scutellum is the triangular elevated area mesad of the bases of the elytra. It is the only exposed portion of the notum when the elytra are in place. The parascutellum (pas) is beneath the scutellum and extends laterad under the bases of the elytra. A groove is formed between the scutellum and parascutellum along the lateral margins of the former for the reception of the antero-mesal margins of the elytra when at rest. With the exception of the scutellum, which is hidden by the parascutellum, the internal aspect of the above structures are shown in figure 14. The phragma (pf) is an invagination of the notum serving for muscle attachment.

The mesothoracic axillary sclerites (ax, Fig. 13) are greatly modified from those found in the primitive Coleoptera so that it is impossible to homologize the sclerites until a thorough study of intermediate forms has been made.

The mesopleuron (Figs. 17, 19) is made up of two sclerites, the episternum (es) and epimeron (em). The pleural suture (ps), which is the external manifestation of the pleural ridge (pr), demarks the episternum and epimeron. A longitudinal carina, shown as a dotted line, divides the epimeron into two areas. The epimeron is united with the episternum along the pleural suture, the other sides being free, which permits free access of air to the metathoracic spiracle (ms) that lies beneath it. The alifer (o), a dorsal process of the episternum, gives support to the elytron. The pleural ridge is formed by the infolding of the posterior margin of the episternum and the anterior margin of the epimeron. It is quite broad dorsally and tapers so that it is much narrower ventrally. The pleural apodeme (pa) is a projection of the dorsal portion of the pleural ridge extending meso-ventrally. There is no trochantin.

The basisternum (bs, Figs. 17, 19) extending in front of and between the coxæ (cx) comprises the greater portion of the mesosternum. The portions in front of the coxæ are the precoxalia (pc). In the mesal region is a pit (pe) in which the prominent portion of the prothoracic basisternum between the coxæ fits. Just behind the pit is a transverse suture dividing the basisternum into two sclerites. Projecting laterad from the pit are distinct carinæ, shown by the dotted lines, which extend into the episternum. The furcasternum (fs) shows externally as a narrow transverse area behind the furcal pits (fp) and coxæ. The pits are the external manifestations of the furcæ (f). When the coxæ are removed the inflexed portions of the furcasternum under them can be seen. The areas behind the coxæ are the precoxalia (pcx). Internally between the furcæ is a sclerotized rod (sr) connecting these inflexed parts of the coxal cavities. The mesothoracic spiracle (msp, Fig. 6) is in the intersegmental membrane connecting the prothorax and mesothorax.

The mesothoracic leg (Fig. 26) is slightly larger but otherwise similar to the prothoracic leg except for the coxa. The coxa (cx) is broader than long and is reduced in movement in its articulation with the body.

The elytron (Fig. 22) is a heavily sclerotized convex structure completely covering one-half of the abdomen. Two main tracheæ (to) with numerous fine branches extend nearly to its tip. The longitudinal margins are inflexed, the lateral one being much more so and greatly thickened. This margin is flattened ventrally so that it can fit snugly against the surface to which the beetle is clinging. It likewise fits closely against the latero-ventral angle along the thorax and abdomen. These margins are hollow and contain body fluids which probably are carried throughout the elytron indicating that the internal tissues are alive. The portion of the elytron serving for attachment to the notum is called the apophysis (ap). The eight, prominent black spots on the elytron referred to in the general description are not shown in the figure.

Metathorax. The metathorax is the largest of the thoracic segments. The notum (Figs. 15, 16) can be divided into four areas: the prescutum (psc), scutum (sc), scutellum (sl), and postscutellum (psl). The prescutum is an arched sclerite narrowed in the middle and broadened laterally. Its posterior margin blends with a semimembranous region connecting it with the scutum. The anterior margin projects into the body cavity forming the prephragma (pph). A membrane connects it with the mesothorax. The scutum (sc) is the largest of the notal areas. It is divided longitudinally by a median groove (mg) which is carried on through the scutellar region. The thickened mesal inflexed portions of the elytra fit into this groove. A large lobe demarked by a suture is evident on each half of the scutum. This arched lobe probably strengthens the body wall and the suture is the external manifestation of invaginations of the body wall serving for muscle attachment. The three lateral projections of the scutum associated with the wing are the suralare (su), adnotale (ad), and adanale (pw). A small muscle disk (m) is in the membrane anterior to the suralare. Three of the axillary sclerites: the notale (n), basanale (ba), and one of the medialia are readily distinguished. The scutellum (sl) is formed of two triangular shaped sclerites and the portion of the median groove dividing them. The post-scutellum (psl) is composed of a narrow transverse sclerite connected to the scutellum by a membranous area. Its posterior margin projects into the body cavity forming the postphragma (po). Lateral prolongations, the postalar bridges (pb), connect the postscutellum with the anepimera (aem, Figs. 18, 20).

The metapleuron (Figs. 18, 20) is divided into two areas, the episternum and epimeron. The pleural suture (ps), which becomes indistinct dorsally, separates the two regions. Internally the pleural ridge (pr) is prominent. The episternum is divided into the katepisternum (kes), which connects the pleuron to the sternum, the anepisternum (aes), and the pre-episternum (pes). About half of the pre-episternum lies beneath the anepisternum. The basalar region (bt) has apparently fused with the anepisternum. The epimeron is subdivided into the katepimeron (kem) and anepimeron (aem). The dorsal portion of the anepimeron is membranous except at the anterior and posterior margins. A prolongation of the anterior portion forms the alifer (o) for supporting the wing while the posterior margin connects with the postalar bridge (pb). A muscle disk (m) is in the membranous region. The trochantin has disappeared.

The metasternum (Figs. 18, 20) is flat and smooth and is larger than the prosternum and mesosternum. The basisternum (bs) is divided longitudinally by a median suture (mu) and transversely by another suture into anterior and posterior regions. The anterior region is inflexed at the mesothoracic coxal cavities. A sclerotized rod (sr) connects these inflexed areas. An indistinct suture separates the mesosternum and metasternum along the inflexed walls of the coxal cavities and the rod connecting them. The furcasternum (fs) consists of a small median sclerite anterior to and between the coxæ and a narrow transverse sclerite in front of each coxa. A median suture (mu) divides it longitudinally. Internally the furcasternum bears the furca (f), a broad, flat piece with six projections. The median suture divides the furca also.

The metathoracic leg (Fig. 25) is about the size of the mesothoracic leg. It differs from the other legs in the shape and the attachment of the coxa (cx). The coxa is attached along its anterior margin and ends so as to give it a restricted hinge-like movement (Figs. 18, 20). It is flattened and tapers at both ends and has the anterior half of the dorsal surface opening into the body cavity. A large muscle disk is attached at the antero-mesal angle of the coxa.

The wing (Fig. 23) is membranous and has a much reduced and peculiar venation. Since Forbes (1922) has made a detailed study of the wings of Coleoptera his interpretations will be followed. The venation is seen clearly in the basal half of the wing only and all of the veins have migrated forward. The subcostal (Sc) and the radial (R) veins are near the costal margin. Probably the basal portion of the subcosta is present forming a small loop with both ends coalesced with the radius. The radius is greatly modified and is so broken up that the parts are difficult to identify. The media is present as a recurrent vein (Mr) and the branch M_4, which coalesces with the cubitus (Cu). The anals (A) show a peculiar looping and portions of the three anals may be present.

The folding of the wing of the bean beetle follows the peculiar venation (Fig. 23). The areas concerned in the folding are numbered from one to five. The positions where the folds occur are shown as solid lines that are lettered from *a* to *n*. Dotted lines are used to indicate variations in the places of folding. By viewing the extended wing from the dorsal aspect the folding can be explained as follows: Area 1 folds under at the oblique line *ab* and lies flat against the ventral surface of the wing. Area 2 folds over onto area 4 at the transverse line *cde*. Area 3 folds over onto area 4 at the longitudinal line *dfng*. Area 4 folds under at the transverse line *hmfli* carrying area 2 with it until area 4 comes into contact with the ventral surface of the wing. A secondary folds occurs at *mn*. Area 5 tends to fold over on the line *kj*, but the point *g* is approximately above the line *kj* when the wing is folded. The areas 2 to 5 are folded more or less simultaneously; the areas 2, 3, and 5 folding approximately at the same time, with area 4 slightly delayed. The folded wing forms a loose mass that permits ample room for wrinkles produced by the angles of the folds.

Abdomen

Eight abdominal tergites are visible when the wings are spread (t, Figs. 30, 31). Probably at least two more are represented by the hidden genital segments (Figs. 32–34). The tergites are not definitely demarked from the pleurites. The first tergite (1t) is semimembranous in texture with the exception of two transverse sclerotized areas near the posterior margin. Tergites two to seven (2t–7t) are rather flexible in texture and become membranous between the segments. A wider membranous area lies between tergites two and three and three and four. A similar area exists in the median region between tergites four and five. The seventh tergite has a small membranous area in the postero-medial region. The eighth tergite (8t) is more heavily sclerotized than the others. Internally the appearance of the tergites is only slightly changed (Fig. 31). A slight invagination at the junction of the tergites is evident. Projections into the body cavity occur laterally between tergites six and seven and seven and eight.

Seven visible pleurites (1p–7p) are present (Figs. 28, 29). The eighth pleurite may be present as a connecting membrane between the tergite and sternite. Externally (Fig. 29) deep folds of the pleurites occur but when the muscle attachments are removed (Fig. 28) they appear as a smooth membrane.

The abdomen has seven spiracles (1sp–7sp, Figs. 28, 29). The first is about three times the size of the second but it is much smaller than the first spiracle of the more primitive Coleoptera and is round instead of elliptical in shape as is found in the generalized forms. The second to the fifth are similar in size, but the sixth and seventh are greatly reduced, appearing as mere specks. Minute tracheæ lead to the sixth and seventh which are still apparently functional. Balsam mounts of the pleuron showed very small openings in a few of these spiracles when examined through the compound microscope.

There are seven visible sternites (2s–8s), the first having fused with the second or else disappeared (Figs. 21, 28, 29). They are heavily sclerotized with the exception of sternite two. This forms the ventral connection of the abdomen with the thorax and is largely membranous except along the posterior margin. The greater portion of this sternite is invisible when the abdomen is in a normal position. The third is the largest of the sternites. It is inflexed along the anterior margin on either side to form the posterior portion of the metathoracic coxal cavities. The mesal part projects cephalad between the mesal ends of the metacoxæ. Posterior to the coxal cavities are the metacoxal plates (ma) demarked by an indistinct suture and ridge. The plates are subdivisions of sternite three (3s). They are usually narrower in the ♂. The posterior margins of sternites four to six in the ♀ (4s–6s, Fig. 29) and three to six in the ♂ (3s–6s, Fig. 21) are sharply demarked, smooth, and more or less transparent. The areas are wider in the ♂ and can be used to distinguish the sexes. Sternite eight (8s, Fig. 21) of the ♂ is notched in the mesal portion of the posterior margin. Oftentimes this notch is hidden by the pubescence on the sternite.

Tanner (1927) has published an excellent paper on the ♀ genitalia of the Coleoptera and Crampton (1929) has made a comparative study of the ♀ genitalia throughout the orders of insects. The ♀ genitalia (Figs. 28–31, 35, 37) are retracted within the eighth segment. Dorsally there are two sclerites, the proctiger (pi) and surstylus (pp). The latter extends over the pleural region to the ventral side. The coxites (co) form the ventral part of the genitalia. Near the ventro-mesal margins of these are deep grooves with sharp lips. The dorsal lip of one coxite fits into the lips of the other coxite so that they interlock. Each coxite bears a stylus (ss) posteriorly, which articulates with the coxite in a membranous area. Wilson (1926) states that the genital tubercle (stylus) is absent. The posterior margins of the surstylus, proctiger, coxites, and styli bear numerous setæ. The anal opening (a) is situated above the genital orifice (g).

The terminal segments of the ♂ are shown from three aspects in Figures 32, 33, and 34. At least parts of the ninth and tenth segments can be distinguished. They are retracted into the eighth segment except during copulation. The anal orifice (a) is situated above the genital opening (g).

The ♂ genital tube in the Coleoptera has been studied comprehensively by Sharp and Muir (1912) and by Muir (1918). Wilson (1926, 7) has published on the genital tube of the Coccinellidae. He has followed the terminology of the former workers. The genital tube (Fig. 36) lies inside the body cavity and is turned on its side. It is quite different from that of the other families of the Coleoptera. The entire structure with the exception of the ejaculatory duct and the enclosing membrane is heavily sclerotized. The ejaculatory duct (ed) leads from the seminal vessicles into a hollow, curved tube, the median lobe (ml). The latter is flattened and slightly expanded at the base and does not form a complete tube in this portion. The median lobe passes through a supporting structure, the tegmen (tg). The tegmen is composed of the basal piece (bp), basal lobe (bl), lateral lobes (ll), and the median strut (mc). The basal piece is the central portion supporting the other structures. The lateral lobes are outgrowths of the tegmen clothed with setae on the distal half. The basal lobe (Wilson, 1926) surrounds the median lobe and has its edges touching but does not form a solid tube. The median strut is an outgrowth of the basal piece in the direction of the base of the median lobe. A sclerotized rod (sr) attached to the basal piece of the tegmen by muscles is probably of a supporting nature and may aid in turning the genital tube when the latter is extruded. A delicate enclosing membrane, not shown in the figure, covers the genital tube and is attached to the genital segments.

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ABBREVIATIONS ON FIGURES

a, Anal orifice
A, Anal veins
ac, Antennal scape
ad, Adnotale
aem, Anepimeron
aes, Anepisternum
anf, Antennifer
ap, Apophysis
as, Antennal socket
at, Anterior arms
ax, Axillary sclerites
b, Bulb
ba, Basanale
bb, Basigalea
bc, Basal sclerite
bl, Basal lobe
bs, Basisternum
bp, Basal piece
bt, Basalar region
c, Condyle
cc, Coxal cavity
cd, Cardo
cl, Claw
co, Coxite
cp, Cardo process
Cu, Cubitus
cx, Coxa
da, Distigalea
ds, United paraglossae
gl, Gula
gp, Gular pits
gs, Gular suture
h, Hypostoma
hp, Hypopharynx
kem, Katepimeron
kes, Katepisternum
l, Labium
la, Lacinia
lc, Lateral cervicales
ll, Lateral lobes
lp, Labial palpus
lr, Labrum, antelabrum
m, Muscle disk
M, Media
ma, Metacoxal plate
mc, Median strut
md, Mandible
me, Mediale
mg, Median groove
ml, Median lobe
mn, Mentum
mo, Median orifice
mp, Maxillary palpus
Mr, Median recurrent vein
ms, Metathoracic spiracle
msp, Mesothoracic spiracle
mt, Magnum foramen
mu, Median suture

dt, Dorsal arm
e, Eye
ed, Ejaculatory duct
em, Epimeron
ep, Epipharynx
es, Episternum
f, Furca
fp, Furcal pit
fr, Femur
frp, Frontal pit
fs, Furcasternum
fu, Flagellum
g, Genital orifice
pf, Phragma
pfr, Palpifer
pgr, Palpiger
ph, Pharynx
pi, Proctiger
pl, Postlabrum
pn, Pronotum
po, Postphragma
pp, Surstylus
pph, Prephragma
pr, Pleural ridge
ps, Pleural suture
psc, Prescutum
psl, Postscutellum
pt, Posterior arm
pw, Adanale
R, Radius
s, Sternite
mx, Maxilla
n, Notale
np, United palpigers
o, Alifer
p, Pleurite
pa, Pleural apodeme
pas, Parascutellum
pb, Postalar bridge
pc, Precoxale
pcx, Postcoxale
pd, Pedicel
pe, Pit
pes, Pre-episternum
sa, Submola
sb, Spur
sc, Scutum
Sc, Subcosta
sl, Scutellum
sm, Submentum
sp, Spiracle
sr, Sclerotized rod
ss, Stylus
st, Stipes
su, Suralare
t, Tergite
ta, Tarsus
tg, Tegmen
ti, Tibia
tu, Trochantin
to, Tracheae
tr, Trochanter

PLATE XXIV

Figure 1. Ventral aspect of head.
Figure 2. Dorsal aspect of head.
Figure 3. Lateral aspect of one-half of tentorium.
Figure 4. Ventral aspect of pharynx, hypopharynx, and epipharynx.
Figure 5. Antenna.

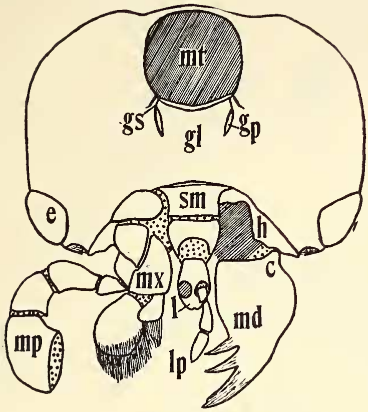
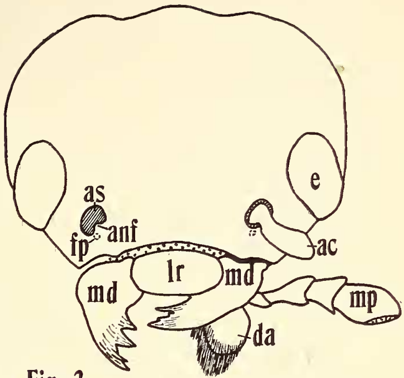


Fig. 1



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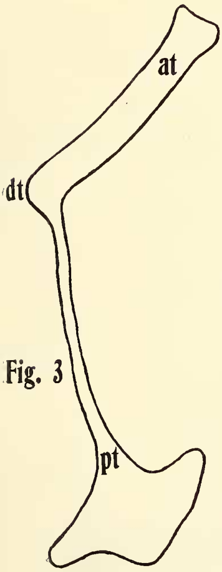

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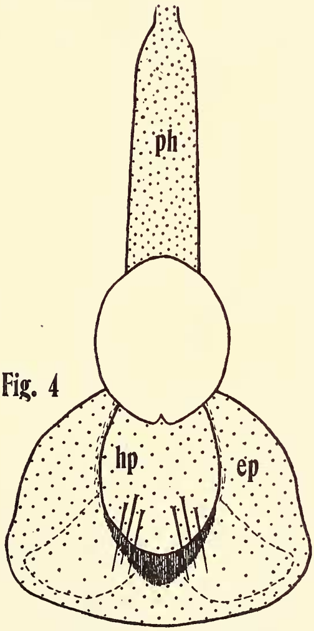


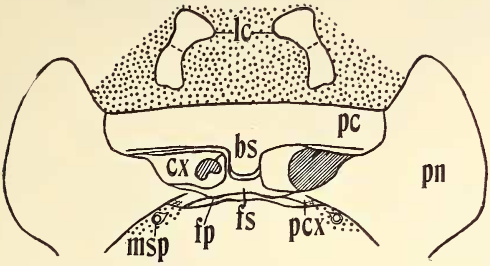
Fig. 4

Fig. 5

EPILACHNA CORRUPTA

PLATE XXV

Figure 6. Ventral aspect of prothorax.
Figure 7. Posterior aspect of prothorax.
Figure 8. Dorsal aspect of pronotum.
Figure 9. Labrum.
Figure 10. Labium.
Figure 11. Maxilla.
Figure 12. Mandible.



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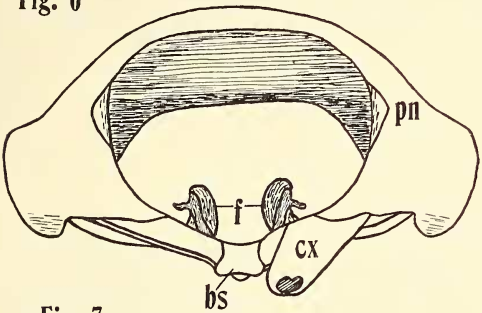

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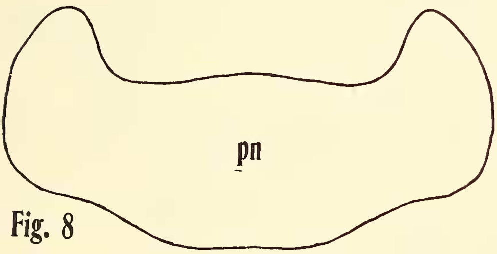
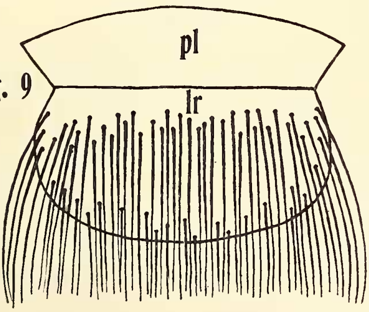
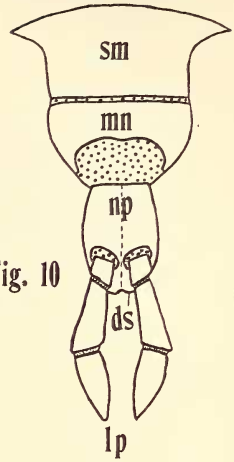


Fig. 8

Fig. 9





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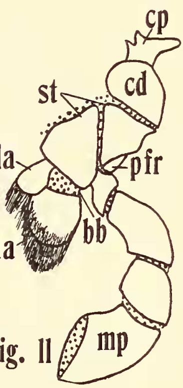

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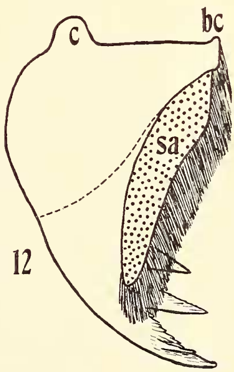


Fig. 12

EPILACHNA CORRUPTA

PLATE XXVI

Figure 13. External aspect of mesonotum.
Figure 14. Internal aspect of mesonotum.
Figure 15. External aspect of metanotum.
Figure 16. Internal aspect of metanotum.

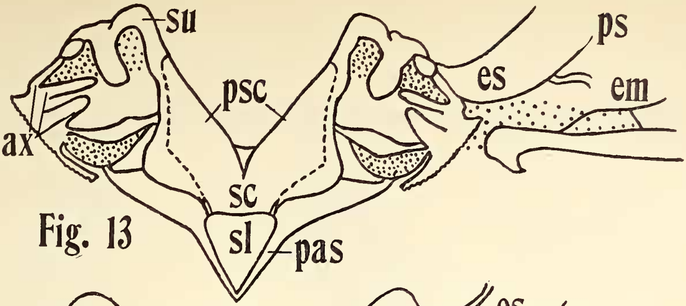
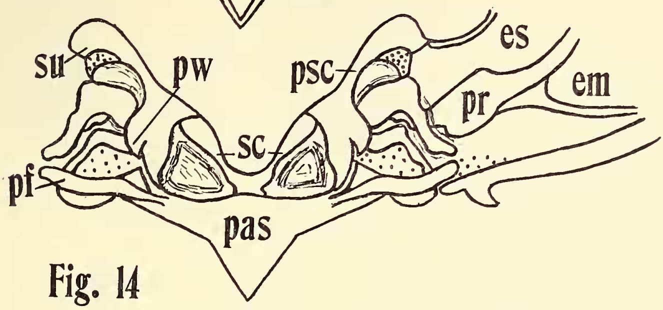


Fig. 13



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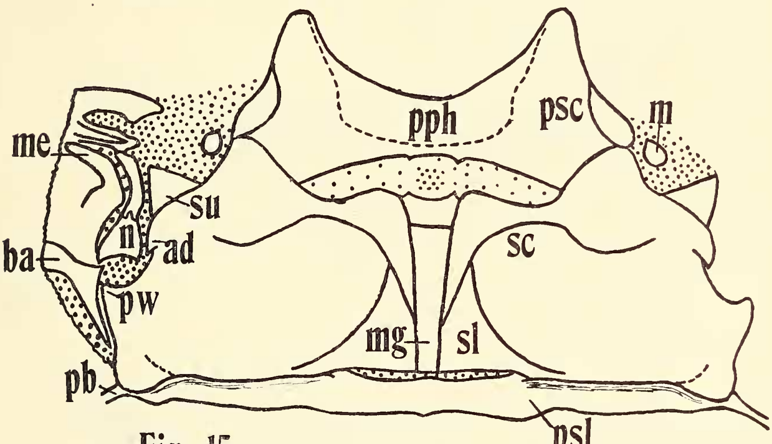

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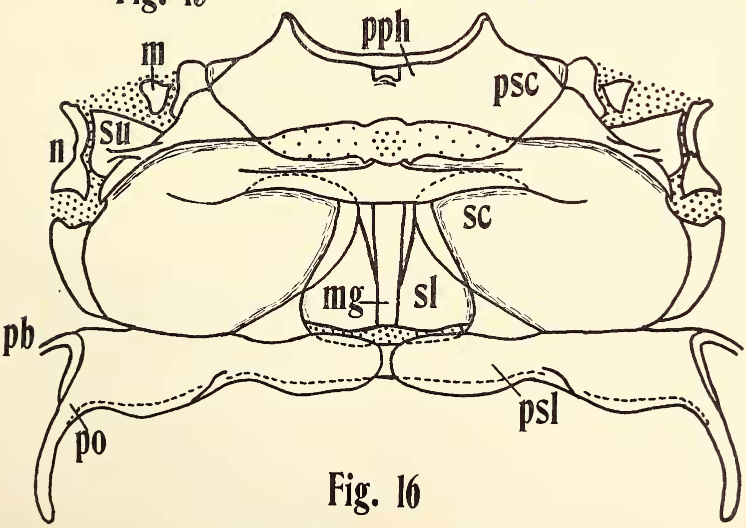
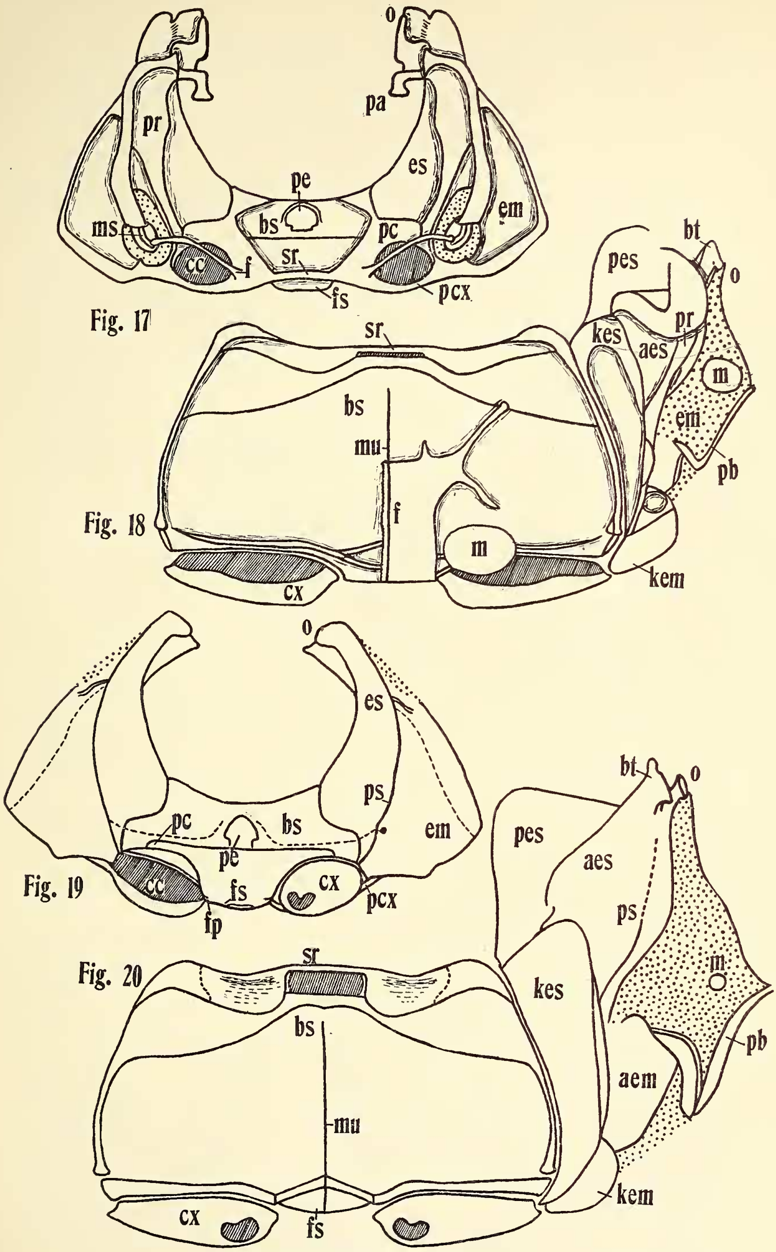


Fig. 16

EPILACHNA CORRUPTA

PLATE XXVII

Figure 17. Internal aspect of mesosternum and mesopleuron.
Figure 18. Internal aspect of metasternum and metapleuron.
Figure 19. External aspect of mesosternum and mesopleuron.
Figure 20. External aspect of metasternum and metapleuron.



EPILACHNA CORRUPTA

PLATE XXVIII

Figure 21. External aspect of ♂ sternites.
Figure 22. Elytron.
Figure 23. Wing.
Figure 24. Prothoracic coxa and trochantin.
Figure 25. Metathoracic leg.
Figure 26. Mesothoracic leg.
Figure 27. Prothoracic leg.

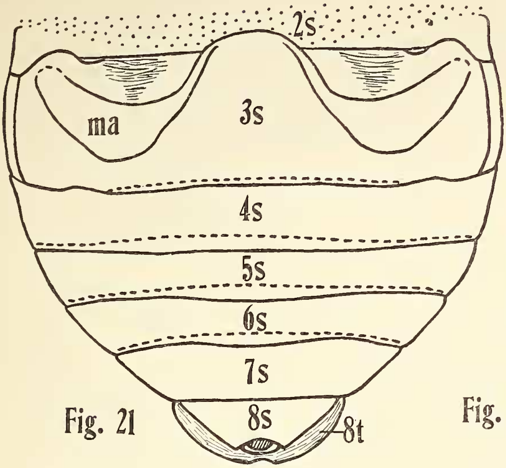
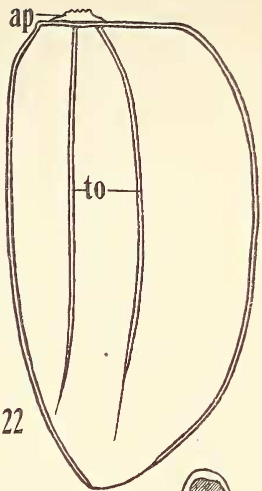


Fig. 21



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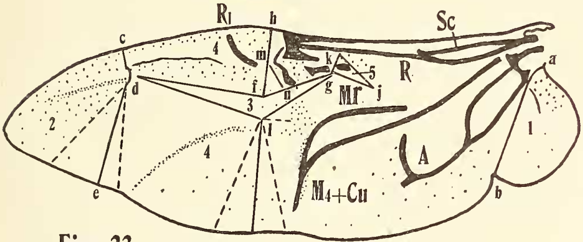


Fig. 23

Fig. 24

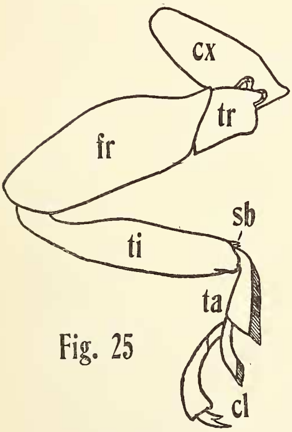


Fig. 25

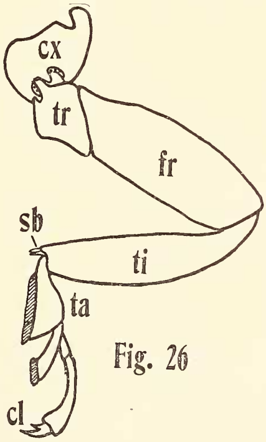


Fig. 26

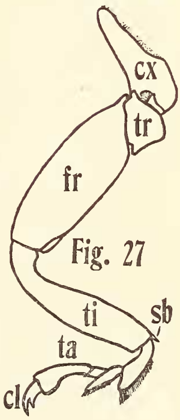
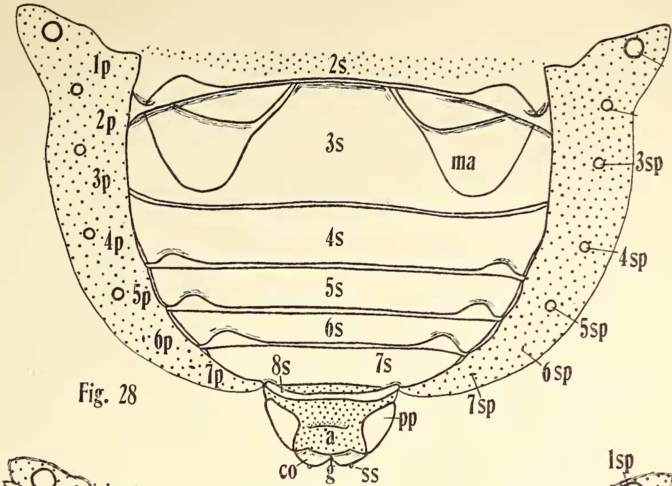


Fig. 27

EPILACHNA CORRUPTA

PLATE XXIX

Figure 28. Internal aspect of ♀ sternites.
Figure 29. External aspect of ♀ sternites.
Figure 30. External aspect of ♀ tergites.
Figure 31. Internal aspect of ♀ tergites.



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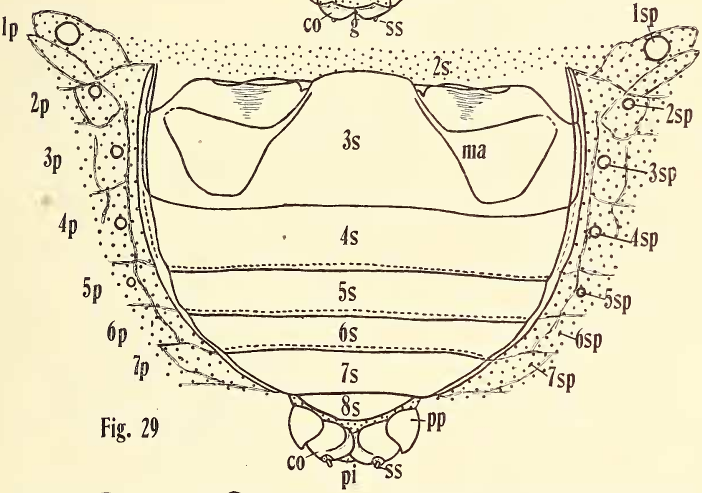

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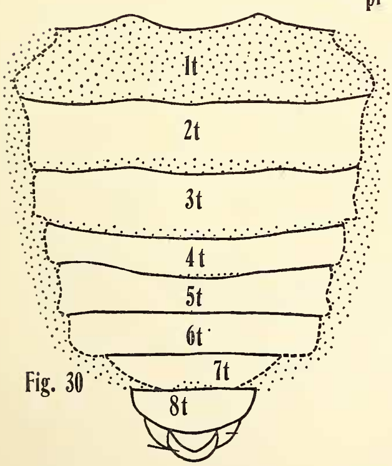


Fig. 30

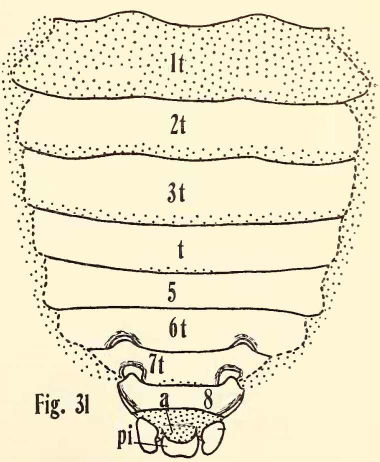
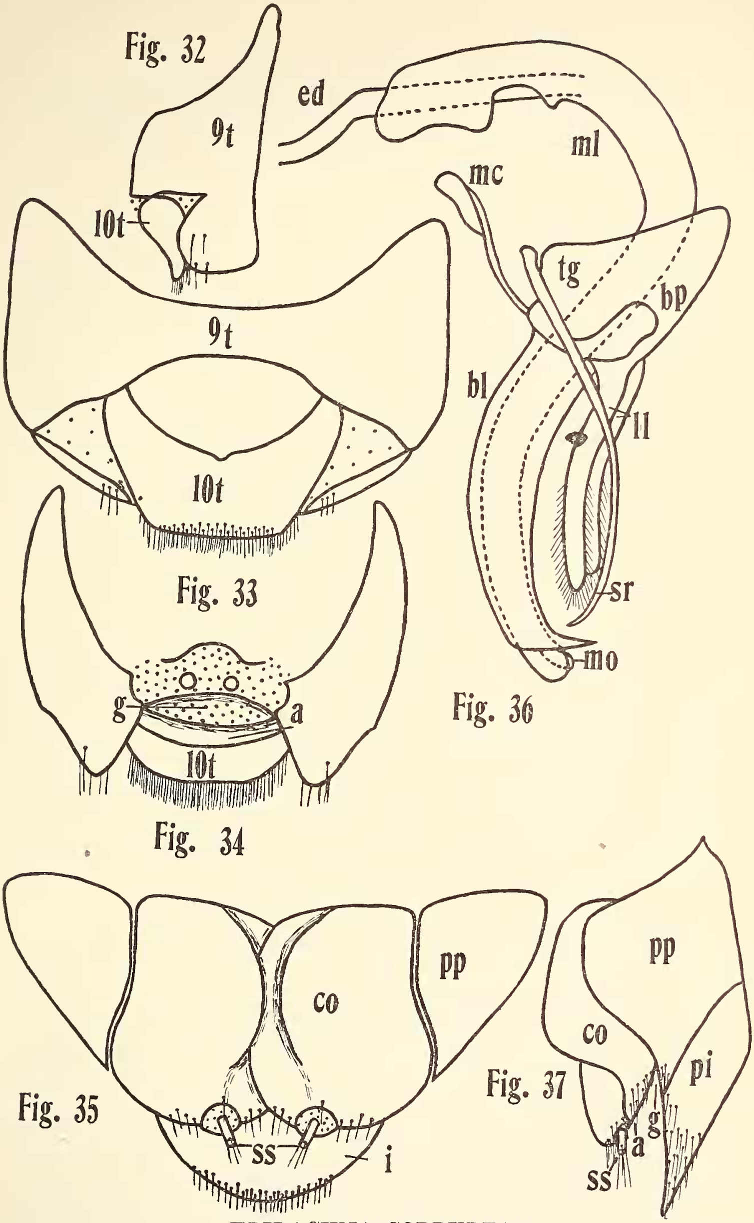


Fig. 31

EPILACHNA CORRUPTA

PLATE XXX

Figure 32. Lateral aspect of ♂ genitalia.
Figure 33. Dorsal aspect of ♂ genitalia.
Figure 34. Ventral aspect of ♂ genitalia.
Figure 35. Ventral aspect of ♀ genitalia.
Figure 36. ♂ genital tube.
Figure 37. Lateral aspect of ♀ genitalia.



EPILACHNA CORRUPTA